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ABSTRACT

Working with three preschool children for nine weeks, a study examined effects on children's spelling when certain ways of employing various computer features are used within the context of a language experience approach. Each Monday and Friday the children were pretested and posttested on four spelling words dictated by the researcher. After Monday's pretest, the children worked with an adult for about five minutes on one of the computer programs for presenting the words. They continued working on the same words in the same programs from Monday through Thursday and were given printouts of the pictures and words they produced. Spelling strategies included preliterate "random" sequences, immediate responses in direct copying, delayed responses in studying a word before it vanished, oral and manual rehearsal, and visual and phonological spelling strategies. These three case studies showed several examples of stronger visual influences on spellings at an earlier stage of spelling development than has been reported with paper and pencil spellings. Overall, results suggested that serious consideration should be given to having children do their spelling on the computer. (One table of data and two figures are included.) (MM)

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Some Spelling Strategies of Young Children on the Microcomputer

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Running head: Some Spelling Strategies

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Abstract

Three prekindergarten children displayed a variety of strategies for spelling the names of pictures on the computer. These strategies were examined after the children had practiced first on a direct copy program and then on a vanishing words program with more recall demands. The strategies included preliterate "random" sequences, immediate responses in direct copying, delayed responses in studying a word before it vanished, oral and manual rehearsal, and visual and phonological spelling strategies. The results suggest ways in which the computer might be useful in advancing children's early spelling and writing.

Some Spelling Strategies of Young Children On the Microcomputer

The computer opens up new possibilities for young children's spelling strategies by presenting conditions which are different from those with paper and pencil. These conditions make some traditional tasks in spelling, such as producing letters that look like print, much easier.

For example, one reason for having children begin to write in manuscript instead of cursive is to help their spelling as well as their reading (Cutright, 1936). With manuscript, the words they write by hand more closely resemble the words they see in print. At best, however, young children's manuscript writing is only a rough approximation to the environmental print they see on signs, labels, and books. Considering the fine motor skills that are demanded in handwriting, which many young children have yet to acquire, even producing a legible letter in manuscript may be a challenge.

It may not be surprising then if paper and pencil children find an easier access to spelling through phonological rather than visual strategies. Phonological strategies emphasize spelling words the way they sound; for example, creative spellings with the name of the letter representing a sound that was heard. Visual strategies emphasize spelling words they way they look; for example, creative spellings with all the correct letters but some letters reversed. Studies of children's spelling development

have generally found visual startegies to be a late development in the transitional stage, occurring after prelíterate, semiphonetic, and phonetic stages (Gentry, 1982; Read, 1986).

With the computer, however, the letterforms produced on the screen by key presses look more like the print children see in their environment. In the case of reproducing a word presented on a computer screen, the duplication can be exact. This should make it easier for children to use visual information for their spelling. In addition, since key presses bypass the fine motor skills that handwriting requires (including laborious erasures), children may devote more attention to the spelling of a word and less attention to how to produce each letter. This suggests that visual spelling strategies may be easier for children on the microcomputer than with pencil and paper.

The computer may also provide assistance with spelling strategies in other ways. For example, teachers sometimes have students copy words in paper and pencil as an aid to remembering their spelling. This strategy may be further modified by instructing children to close their eyes and visualize the word before they write it or to cover the word and then write it (Gentry, 1987). By itself, copying can be done more easily on the computer, where there is no need to form the letters by hand. The child only needs to recall the letter from the time it takes to identify the letter on the screen and then press the corresponding key.

In addition, the computer can arrange recall requirements which are the equivalent of covering up a word before writing it. The word to be spelled can be vanished after the first letter is typed, allowing the word to reappear (the equivalent to uncovering a word) on mistakes and requests for help (e.g. by pressing the RETURN key). The child is now prompted to recall the letters after the first letter over a longer period of time than in direct copying. Furthermore, unlike the child's efforts in paper and pencil, the computer does not need to show any misspellings. The child may press an incorrect letter, but it does not need to appear on the screen. The only letters to appear may be the ones for the correct spelling. This should be an advantage because there is evidence that simply seeing an incorrectly spelled word makes it more likely for that word to be misspelled in the future (Brown, 1988).

The following examines some of the effects on children's spelling when some of the many ways for employing these computer features are tried out within the context of a language experience approach (Moxley & Barry, 1985; Salinger, 1988; Warash, 1986). For that reason, the spelling activities began with labels for familiar pictures and led to dictated stories.

Method

We worked with three children for nine weeks: Joseph (5 yrs., 1 mo.), Jennifer (4 yrs. 9 mo.), and Nigel (4 yrs. 3 mo.) at the West Virginia University Child Development

Laboratory. The children worked on an Apple IIe in a corner of the office with one or the other of the authors.

Each Monday and Friday the children were pretested and postested on four spelling words dictated by the first author. The words were dictated from one of nine randomly selected sets of four spelling words, consisting of one three-letter word, two four-letter words, and one five-letter word. After Monday's pretest, the children worked for about five minutes on one of the computer programs for presenting the words. They continued working on the same words in the same programs from Monday through Thursday and were given printouts of the pictures and words they produced. On Friday they were postested.

A single-case, multiple baseline design was used to provide basic data for the three case studies (see Barlow & Hersen, 1984; Kazdin, 1982). All the children started with the Direct Copy program before switching to the Vanishing Words program. Joseph switched after the third week, Jennifer after the fourth week, and Nigel after the fifth week. Nigel missed Thursday and Friday of the 3rd week and, therefore, does not have a Friday posttest for that week. In addition, Jennifer was absent on Thursday of the 4th week, and all three of the children were absent on Tuesday of the 8th week.

In the Direct Copy program, the word was presented on the screen, and pronounced by the teacher, as a model for the child to copy below. When the child pressed the key for the correct letter, it appeared on the screen directly beneath the

corresponding letter in the model. If the child pressed the key for an incorrect letter, a beep sounded and the incorrect letter did not appear. After the child put all the correct letters on the screen and pressed the space bar, the word was highlighted and a picture of the word appeared on the screen. A new word would then appear, and the cycle continued until the child had spelled four words correctly.

In the Vanishing Words program, the word disappeared as soon as a correct key was pressed. These letters would reappear when an error was made or the RETURN key (for help) was pressed. In this way the children 1) could study the letters in a word as long as they wanted, 2) could have the letters reappear whenever they wanted, and 3) were prompted to recall more than one letter over a longer period of time than with Direct Copy. Figure 1 shows an example of a printout from one of the daily practice sessions with Vanishing Words. These printouts show pictures for the words, a list of the words, a record of errors and requests for help within brackets, and the "computer time" between the presentation of the word and pressing the spacebar after its correct completion. Within the brackets, WAR shows that Joseph hit R instead of T after typing WA, recalling an accurate letter but in the wrong order. The computer then automatically reshowed this word on the screen, allowing Joseph to copy the E directly. The word then disappeared again. The WATE HELP records that Joseph then pressed the RETURN key to have it reshown.

Insert Figure 1 about here

On the eleventh week, some words from the children's previous practice sessions were reviewed in order to see how well the children would write these words in sentences. After pretesting on cow, barn, and grass, the children spelled these words on Vanishing Words for two days and then just cow and grass the next two days. Each day, after spelling the words in isolation, they dictated a sentence to the teacher which contained one or more of these words. The teacher typed the dictated sentence into the Vanishing Words program. When the child typed in the first letter for a word in the sentence, the rest of the letters in the word vanished, but the other words remained on the screen. In other respects, spelling sentences was like spelling words in isolation except that the children's type appeared in the location that was vacated when the model vanished, no pictures appeared, and the children needed to press the space bar between words and the period key at the end. On Friday, the children were posttested on spelling the three words in isolation; and they also dictated a sentence containing one or more of these words to the teacher, who then dictated it back for them to type on the computer.

On the 12th week, anecdotal information was collected from parent responses to the question, "What kind of interest does your child show in spelling?"

Results

Table 1 shows all the words and how they were spelled by the children on each week's pretest and posttest. Figure 2 shows the trends for the correct letters on the pretests and posttests for the Direct Copy and the Vanishing Words.

Insert Table 1 and Figure 2 about here

Joseph

In Direct Copy, Joseph showed evidence of an early semiphonetic stage (see Gentry, 1982) of phonological spelling in substituting voiced /Z/ for the unvoiced /S/ in Z/sand and Z/grass, but he was only able to produce the correct first letter for 3 words, R/road, SD/star, and POH/pig. He also showed a visual reversal in GO/dog. Although Joseph started out the first week with one of his higher posttest scores, he quickly declined to posttest scores which were below even his pretest scores. Some of his creative spellings in the third week posttest show adjacent key hits, which were observed as separate key presses rather than pressing two keys at the same time, PO in POH/pig, SD in SDP/tree, OP in OPK/ball, and LKJ in LKJY/horse. These spellings indicate some reliance on a

guessing strategy, although it also shows some knowledge of the number of letters in a word.

In Vanishing Words, Joseph spelled 17 first letters correctly on posttests, a much greater number and a higher median average per session than in Direct Copy (3 to 1). He showed his highest performances in recall skills near the beginning of Vanishing Words (e.g. the 5th week when the visual reversal BYO/boy occurred) and then finished at a median posttest score of 4 correct letters, as compared to his median posttest score of 1 correct letter with direct copy. In the last weeks, Joseph seemed to return to his earlier adjacent-key strategy for guessing in RTY/rain and SDF/snow; however his posttest scores continued to remain above his pretest scores.

Joseph's newly found success in first letter spellings may reflect some success in integrating phonological and visual skills for initial consonant spellings in that, overall, 10 of the correct 1st letter spellings on his posttests were incorrect on the pretests. However, he also showed some difficulty in integrating the two skills. For example, in his 8th week posttest, he first put down K and then said he "remembered" a C, which he added in KC/cow. In that same session, he also shows what appears to be a phonological letter name spelling of Y for /w/ and perhaps a visual identification of T in TYN/water.

In his followup, Joseph spelled KLO/cow, PDR/barn, GTW/grass on the pretest and COW/cow, B/barn, GRASS/grass on

posttest. The practice sentences he dictated and typed on Vanishing Words were THE COW IS EATING THE GRASS/THE COW ATE GRASS/THE COW ATE THE GRASS/THE COW WALKED ON GRASS. On Friday, without any assistance from the computer programs, he typed ICOWSJUHTGRASS [the cow stepped on the grass] in the following order: I/the, COW/cow, S/stepped, JU/on, HT/the, and GRASS/grass. These spellings reflect his accumulated exposure to the visual form of these words.

For Joseph's interest in spelling, his mother wrote: "A great deal of interest. He has started to enjoy writing letters to people and often asks me how to spell words. He also attempts to sound out words and spell them on his own."

Jennifer

In Direct Copy, Jennifer's phonological spelling skills were also at the semiphonetic stage but a little more advanced than Joseph's. She was more accurate in getting the first letter correct and in substituting an equivalent first letter sound, e.g. C/sled.

In Vanishing Words, Jennifer produced higher posttest scores, moving from a median of 4 correct letters to a median of 9. In particular she showed a large increase in the number of correct letters beyond the first letter, from only 2 additional correct letters in Direct Copy to 21 in Vanishing Words, from a median of .5 per session to 4 per session. Although she produced some phonological spellings, e.g. CEO/snow on her pretest, her most striking advances appeared to come from visual influences in letter patterns, e.g.

APP/apple, BNNY/bunny, HREEP/sheep; reversals, e.g. TAC/cat, WOO/cow; and correct spellings for CAR, MOON, and YARN. Interestingly, she showed some difficulty in recalling the first letter in WOO/cow, HREEP/sheep, which may have resulted from the fact that the letters of the presented word always remained on the screen until the key for the first letter was pressed. This suggests her practice strategy may have been to copy the first letter and then recall the others, the delayed responses in recall being more effective than the immediate response in copying.

In addition, Jennifer showed a creative interest in developing an explicit recall strategy during Vanishing Words. One day she tried to place her fingers simultaneously on all the keys for the letters when the word was shown on the screen. On another day, she tried singing the letters in the word (as a child would sing the alphabet song). Finally she settled on repeating the names of the letters to herself several times. This evolved into the following strategy. First, she would point to each letter in the word and say its name in order. Then she would repeat the letters aloud faster without pointing. Then she would locate each key with her finger as she said each letter but did not depress the key, and then she would press the appropriate key as she said each letter. The total number of spoken rehearsals varied. In her daily practice sessions, her rehearsal strategy became so successful that she only pressed the RETURN key for help once in the last week, spelling 15 words in the practice sessions

that week without help. On the posttests, she did not always rehearse the letters aloud. In the 9th week, for example, she spelled YARN silently.

In her followup, Jennifer spelled COOW/cow, BAY/barn, GHS/grass on the pretest and COW/cow, BOY/barn, GRASS/grass on posttest. When she spelled grass, she began with GAR, stopped, looked, deleted it; then did GAS, stopped, looked, deleted it; and then did GRASS. When she saw GRASS she expressed confidence it was correct. Her practice sentences on Vanishing Words were THIS IS A COW/THIS IS A COW/THIS IS SOME GRASS/THIS IS A COW. For her sentence on Friday without help from the computer programs, she wrote ETH COW ESSN TEHG GRASS [the cow eats the grass] in the following order: ETH/the, COW/cow, ESSN/eats, TEHG/the, and GRASS/grass. The extra G in TEHG represents the first letter of grass, but she then remembered she had forgotten to put a space after the word. She then erased all but the G of GRASS, put in a space, and respelled GRASS. In addition to reflecting her accumulated exposure to the visual form of words, these spellings also show a continuing accumulation of new visual strategies for spelling words: from an analogical whole in BOY/barn, to the visual editing and respelling of grass, to spacing between words in spelling the sentence dictated to her.

On Jennifer's interest in spelling, her mother wrote "Great interest! She copies words and sentences from books. Jennifer also insists on writing her own messages on her cards

and pictures (and constantly says, "Mom, how do you spell _____?").

Nigel

In Direct Copy, Nigel showed the most advanced phonological knowledge of all the children in producing semiphonetic spellings on his pretests. He also showed visual influences in picking up alternative and more accurate representations for letter sounds, e.g. SN instead of CN for snow, APP instead of AP for apple, and in his correct spellings for DOG and MAN. ROD/road is interesting in that it is an example of a phonetic spelling using the letter name for the vowel, but the production of this spelling seems to have depended on the visual appearance of road in the Direct Copy sessions since he spelled R/road on the pretest and did not represent the vowel sound in any of his other pretest spellings.

In Vanishing Words, Nigel showed more advance phonological spellings that included representations for vowels on his pretests, e.g. SNO/snow, ERON/yarn. He also continued to show visual influences in using more accurate letter patterns for letter sounds on his posttests, e.g. CAW instead of CEL in CAW/cow and WTR instead of WDR in WTRH/water; and in correct spellings for CAR, CAT, MOON (also spelled correctly on pretest), HAY and SNOW. Overall, he moved from a median of 9 correct letters in Direct Copy to 11.5 correct letters in Vanishing Words.

Interestingly enough, except for MOD/woman the first week, Nigel did not show the reversal of letter sequences on posttests that the other children did. This suggests that he systematically integrated what he was learning visually into his phonological spelling strategies. He repeatedly sounded out letter sounds before typing them in and later used many of the visual forms he had seen for the corresponding sounds in the words on his posttests. His phonological knowledge, then, seemed to act as a check in assuring that the letters he recalled were spelled in their correct order.

Additional evidence for Nigel's ability to integrate visual information into his phonological strategies shows up in comparing his pretest scores with the other children's. These pretests of new words offered a relatively better opportunity to use phonological strategies in comparison with the posttests which, after a week's exposure to the visual form of the words, offered a relatively better opportunity to use visual information. At first, Joseph and Jennifer produced no correct letters on their pretests, as if they did not even consider letter sound relationships. From the second pretest on, however, both Joseph and Jennifer were consistently identifying correct letters on pretests; but they did not increase their pretest scores as much as Nigel did. Nigel used letter/sound relationships from the beginning in his pretests and showed improved pretest scores during Vanishing Words, which suggests he was integrating visual information into his phonological skills during this time.

Phonological strategies require some visual information in matching sounds to particular letters, and Nigel may have used what he was learning during the week to enhance his phonological spelling skills on the next week's pretest.

In his followup, Nigel spelled KALW/cow, BORN/barn, GRAS/grass on the pretest and COW/cow, BARN/barn, GRASS/grass on the posttest. His practice sentences on Vanishing Words were THE COW IS IN THE BARN/COW EATING GRASS/THE COW IS EATING/THE COW WAS IN THE BARN. For his Friday sentence, without help from the computer programs, he wrote THECOWISWOKGINTHEBARN [the cow is walking in the barn] in the following order: THE/the, COW/cow, IS/is, WOKG/walking, IN/in, THE/the, BARN/barn. These spellings reflect his accumulated exposure to the visual form of these words and a continuing ability to integrate visual with phonological knowledge. Interestingly, Nigel recalled the final G in WOKG/walking rather than the N, which would be a more typical phonological representation.

His mother wrote: "He wants to know how to spell <u>every</u> word he hears--and often attempts to spell the words on his own."

Discussion

The above shows a wide range of spelling strategies among the children. Joseph, who showed the least spelling skill, was also the most likely to use preliterate guessing or simply hitting keys in sequence. This was not an unreasonable strategy since the correct spelling of the word would

eventually be recorded in this way. In one sense this "random" strategy (not quite random because influences such as proximity appeared to be operating) was the easiest way to spell a word since it placed no demands on recall. The recall effort in both of these programs may have been too great to prevent Joseph from returning to a more comfortable reliance on his "easy" strategy, which was most pronounced in Direct Copy, e.g. LKJY/horse. In both the Direct Copy and the Vanishing Words, John's posttest scores show a later decline although not as rapidly with the Vanishing Words as in Direct Copy where the later posttest scores were below the pretest scores. This suggests that children like Joseph might benefit from an easier introduction to recalling letters, perhaps learning to recall only the first letter of a word, as in some phonics programs (which could also be programmed on the computer).

Jennifer's spelling showed the greatest benefit from Vanishing Words. Although we cannot rule out the possibility of some interaction effects from the previous Direct Copying, the change in the acceleration of her progress after switching to Vanishing Words is pronounced and would not be predicted from simply continuing Direct Copy. It appears that Vanishing Words encourages children like Jennifer to experiment with recall strategies like rehearsal, which they may not have pursued if left to the easier strategy of Direct Copy. Through these strategies, Jennifer apparently learned how to examine and inspect the letters in words in more detail than

is needed for copying or even good reading (see Frith, 1985). Her strategy of readying her fingers over the keys to be hit, which we have also observed in another child, also suggests that young children might be receptive to instruction in the finger placements of touch typing.

Nigel showed the strongest "integration strategy" in incorporating visual knowledge into his phonological skills. This is indicated by his lack of visual reversals and the relatively high level of his pretest scores in Vanishing Words. In becoming better at predicting what the visual forms might be from the sounds he heard, Nigel appeared to be using what might be described as orthographic analogies. He was applying what he knew of the spelling of old words to the spelling of new words. Recent research indicates children can use analogy in spelling at an earlier stage of development than has previously been suggested (Goswami, 1988). Spelling on the computer, with its enhancement of visual information, may facilitate the development of analogical spelling. Computer spelling, then, may not just facilitate the spelling of particular words; it may facilitate the development of spelling strategies which can be used on other words.

The relative ease with which a Nigel incorporates strategies or a Jennifer switches to a new spelling strategy stands in contrast to some children, like Joseph, who fall back on or retain a more primitve strategy. Some other children we have worked with on occasion have also shown a tendency to stay with a strategy, repeatedly generating long

strings of letters from random-like key presses or repeatedly pressing the RETURN key to copy the letters after a word has vanished. This may indicate a need for some children to retain a particular strategy for a while or the need for more changes in the programs to help children shift their strategies.

One change might be to have Vanishing Words reshow a word only when the RETURN key is hit. Allowing the word to be reshown when an error is made may encourage a "random" selection of keys in which there is either a correct choice or help for copying. Another change might be to simply eliminate the Direct Copy as a separate program. In all three cases, the Vanishing Words condition produced as good as or better results on the posttests than the Direct Copy. This suggests that direct copying activities may only need to be a brief introductory activity, if used at all, before providing children spelling experience with Vanishing Words, which has a direct copy option.

These three case studies also showed several examples of stronger visual influences on spellings at an earlier stage of spelling development than has been reported with paper and pencil spellers. For the most part, Joseph and Jennifer's pretests are confined to a mixture of prelíterate and semiphonetic spellings although their posttests show instances of creative spellings that would normally be considered as evidence for phonetic and transitional stages. In addition, Nigel shows movement from semiphonetic to phonetic and

standard spellings from pretest to posttest as well as from early pretests to later pretests. This is a particularly promising outcome because all children must become skilled at responding to the visual appearance of words if they are to become good spellers.

Overall, the results suggest that serious consideration should be given to having children do their spelling on the computer. For introducing children to effective spelling strategies, language experience activities on the computer could be used like those presented above. For traditional spelling tests in the elementary grades, the words could be dictated by the teacher or by a computer with speech synthesis. It would be fairly easy for a computer to determine if the word the child spelled was one that was on a child's spelling list; and the computer could do all the scoring and produce all the records of the scores including each key press and the time that was taken. The point at which children are ready to improve their rate of spelling a word may also be the point at which they are ready to learn touch typing. The children could also keep individual disks to practice their own individually assigned, or selected, words suitable to their level of spelling development.

The promise which the computer offers in reducing the difficulties in learning to spell is particularly important for young children who are unable or reluctant to invent phonological spellings with paper and pencil as well as for older children who have difficulty in making the move from

creative to standardized spellings. In addition, the anecdotal comments by parents suggest that these computer activities support, or are consistent with, a favorable attitude toward spelling and a general interest in writing away from the computer.

References

Barlow, D. H., & Hersen, M. (1984). Single case experimental designs (2nd ed.). Columbus, OH: Merrill.

Brown, A. C. (1988). Encountering misspellings and spelling performance. Journal of Educational Psychology, 80, 488-494.

Cutright, P. (1936). Script-print and beginning reading and spelling. Elementary English, 13, 139-141, 160.

Frith, U. (1985). Beneath the surface of developmental dyslexia. In K. E. Patterson, J. C. Marshall, and M. Coltheart (Eds.), Surface dyslexia: Neurophychological and cognitive studies of phonological reading (pp. 301-330). Hillsdale, NJ: Erlbaum.

Gentry, J. R. (1982). An analysis of developmental spelling in GNYS AT WRK. The Reading Teacher, 36, 192-200.

Gentry, J. R. (1987). Spel . . . is a four-letter word. Portsmouth, NH: Heinemann.

Goswami, U. (1988). Children's use of analogy in learning to spell. British Journal of Developmental Psychology, 6, 21-33.

Kazdin, A. E. (1982). Single-case research designs. New York: Oxford.

Moxley, R. A., & Barry, P. J. (1985). Spelling with LEA on the microcomputer. The Reading Teacher, 39, 267-273.

Read, C. (1986). Children's creative spelling. London: Routledge & Kegan Paul.

Salinger, T. S. (1988). Language experience as an introduction to word processing. In J. L. Hoot & S. B.

Silvern (Eds.), Writing with computers in the early grades (pp. 90-104). NY: Teachers College Press.

Warash, B. (1986). Using the computer in a language experience approach. Journal of Language Experience, 7, 38-42.

Authors' Note

A free copy of the current version of the microcomputer programs used in this study and a guide for using them may be obtained by sending a blank disk with a large, stamped and addressed return envelope to the author of the programs, Roy Moxley, 604 Allen Hall, West Virginia University, Morgantown, WV 26506-6122. Terrapin Logo Plus must be loaded first on an Apple IIc or IIe in order to run these programs without modification.

Figure Captions

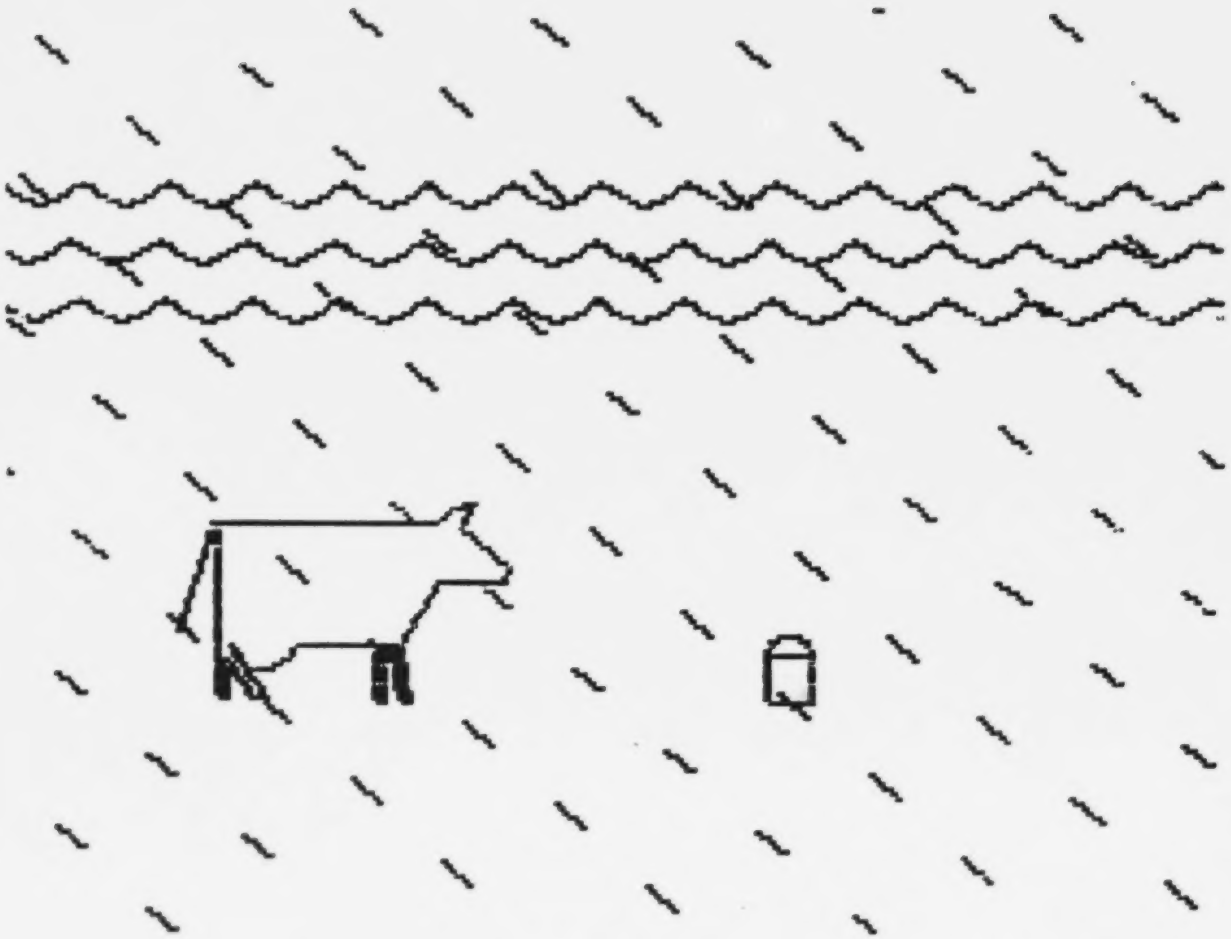
Figure 1. An example of a printout from a practice session on Vanishing Words (Joseph/Tuesday/8th week).

Figure 2. Pre and posttest progress.

Table 1

Children's Spelling

		Joseph		Jennifer		Nigel	
Week	Words	Pre	Post	Pre	Post	Pre	Post
1st	DOG	-	GO	-	D	D	DOG
	ROAD	-	R	-	R	R	ROD
	SAND	-	Z	-	S	SN	SOD
	WOMAN	-	M	-	O	-	MOD
2nd	MAN	SRZ	R	-	MN	M	MAN
	SLED	S	Z	C	C	S	SD
	STAR	R	SD	-	R	S	S
	GRASS	Z	ZT	G	GGT	G	GR
3rd	PIG	-	POH	PB	PIO	PG	(absent)
	TREE	RT	SDP	T	G	T	
	BALL	AS	OPK	BE	B	B	
	HORSE	F	LKJY	GHK	H	H	
	Vanishing Words introduced						
4th	SUN	-	SF	S	S	CN	SN
	BARN	DFH	P	B	B	BR	BRN
	BIRD	EDFT	B	B	B	BR	BR
	HOUSE	OKI	H	H	HI	HS	HS
	Vanishing Words introduced						
5th	BOY	AS	BYO	BEB	B	B	BY
	BOAT	HJB	B	BNB	B	BD	BT
	FISH	F	FP	F	F	F	FI
	APPLE	A	A	A	APP	AP	APP
	Vanishing Words introduced						
6th	CAR	R	R	C	CAR	CR	CAR
	GIRL	G	G	GH	G	GR	GHR
	HILL	L	LL	B	H	L	HI
	BUNNY	PB	B	-	BNNY	BY	BNI
7th	CAT	C	C	CTC	TAC	CA	CAT
	KITE	K	K	-	K	CYA	KT
	MOON	B	M	NMN	MOON	MOON	MOON
	TRUCK	R	R	T	T	TRC	TRC
8th	COW	K	KC	BC	WOO	CEL	CAW
	PAIL	P	PHJ	P	PPOT	PIL	PAL
	RAIN	RL	RTY	R	RTY	RAN	RAN
	WATER	Y	TYN	W	WTU	WDR	WTRH
9th	HAY	H	H	HTC	HYI	HAE	HAY
	SNOW	SDF	SDF	CEO	SRU	SNO	SNOW
	YARN	P	NHF	ERTH	YARN	ERON	YORN
	SHEEP	JKO	SEW	TRPB	HREEP	CEP	SYPU



RAIN [] TIME.72
WATER [WAR WATE HELP] TIME.60
COW [] TIME.30
PAIL [] TIME.30

191.4 "COMPUTER" SECONDS
16 CORRECT LETTERS AND PUNCTUATION MARKS
12 SECONDS PER CORRECT LETTER

Figure 1. An example of a printout from a practice session on Vanishing Words (Joseph/Tuesday/8th week).

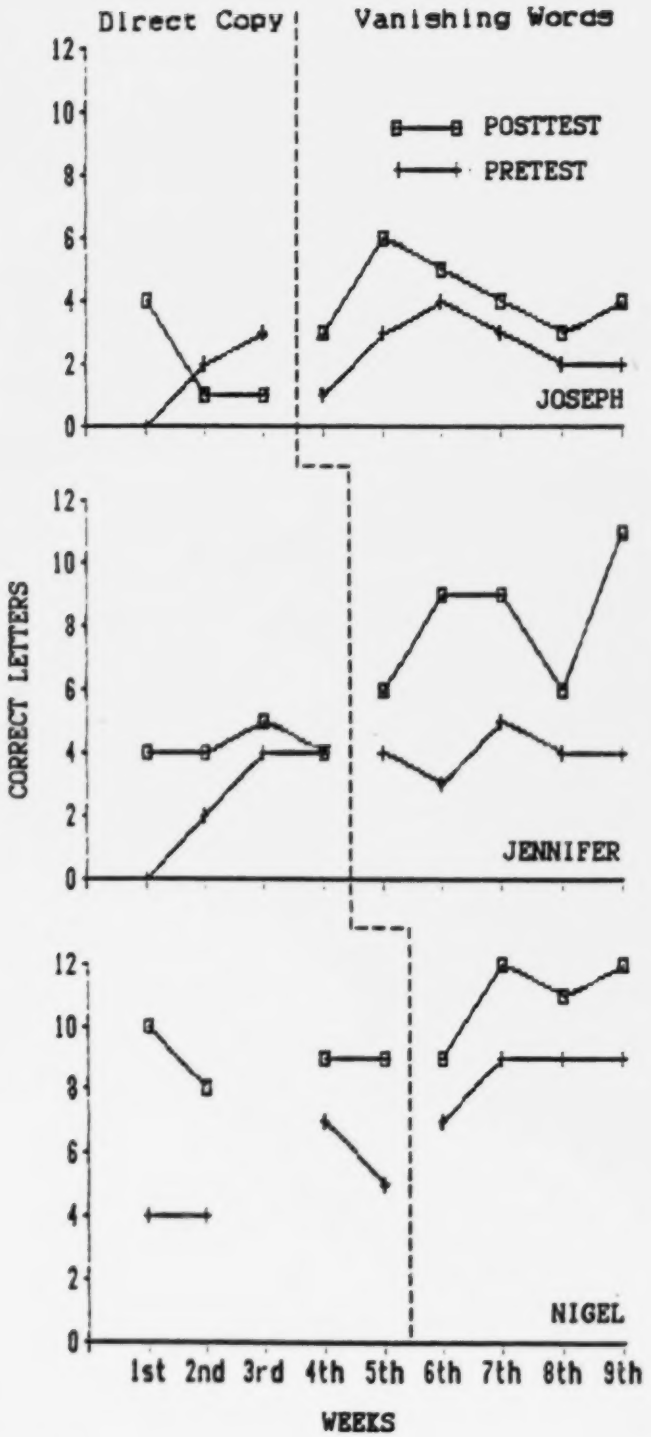


Figure 2. Pre and posttest progress.